

REMARKS

This is in response to the Office Action of February 3, 2005. In that Office Action:

Claims 3-5 were rejected under 35 USC §112, second paragraph, as being indefinite on the grounds that the phrase "their basic position" lacked antecedent support;

Claims 1-3, 8, 10 and 11 were rejected under 35 USC §102(b) as being anticipated by U.S. Patent No. 5,076,623 to Richards;

Claims 1-8, 10 and 11 were rejected under 35 USC §102(b) as being anticipated by U.S. Patent No. 5,645,302 to Horimoto;

Claims 1-5, 8, 10 and 11 were rejected under 35 USC §102(b) as being anticipated by U.S. Patent No. 3,837,525 to Kobayashi;

Claims 1-5, 8, 9 and 11 were rejected under 35 USC §102(b) as being anticipated by Japanese Patent No. 4-331895; and

Claims 1-4, 8, 10 and 11 were rejected under 35 USC §102(b) as being anticipated by U.S. Patent No. 4,260,180 to Halushka.

By this Amendment, pending claims 1-11 have been canceled and new claims 16-25 have been added. Applicants submit that new claims 16-25 overcome the rejections under 35 USC §112, second paragraph, as well as the rejections based on art.

New claims 16 and 17 are directed to a system of two drilling rods (or a system of a transmitter housing and drill bit) which are connected with each other by, for example, at least one locking element. The locking element is moveably engaged in an end portion of a first of the drilling rods (or in

one of either the transmitter housing or drill bit) and can be moved by means of magnetic force into a locking position in which the locking element engages into a corresponding groove in an end portion of the second of the drilling rods (or the transmitter housing or drill bit), or out of the locking position, so that the locking element disengages the groove.

New method claims 24 and 25 are directed to methods of releasing and connecting two drill rods or a transmitter housing and drill bit.

Applicants submit that the subject matter of the present (new) claims is not anticipated by and would not have been obvious in view of the cited prior art, because none of the documents of the prior art discloses or suggests a system of either two drilling rods or of a transmitter housing and a drill bit which are to be connected by means of a magnetically induced movement of a locking element. In fact none of the documents discloses a coupling for parts of drill string at all.

Generally speaking, the present invention relates to a connection of two parts of a drill string used for horizontal earth drillings. In such drillings, heavy demands are made on the connections between the parts of a drilling string, especially on the connections between the two drilling rods (e.g., claims 15, 24) and of a transmitter housing and a drill bit (e.g., claims 16, 25).

Such drill strings for horizontal earth drilling are

normally used for the trenchless laying of pipes underground. This process includes the drilling of a horizontal pilot bore, using a drill bit which is pushed and rotated by a drive which is usually positioned over ground. The torque and pushing forces which are necessary for forcing the drill head into the soil are transmitted over a drill string to the drill bit.

The drill string generally consists of a large number of drilling rods which are coupled to one another according to the advancement of the drilling bit in the soil. For economic reasons, the process of coupling the drilling rods needs to be accomplished fast and easily while still offering a safe transmission of high pushing and rotational forces.

After completing the pilot bore, the drill bit is usually exchanged for an expansion head which itself is generally fixed to a new pipe which is to be drawn into the soil. Thus, the drill string that is used for drilling the pilot bore is also used for pulling an expansion head and a new pipe through the pilot bore, thereby enlarging the pilot bore and pulling in the new pipe.

Accordingly, the connection between the drilling rods needs to be able to transmit high pulling as well as pushing and rotational forces. Further demands on the couplings of drilling rods are based on the possible soiling while a drill string is moved underground. Under any circumstances, blocking of the connection due to dirt within the connection needs to be

avoided.

Due to the requirements described above, threaded connections between drill rods are still widely used, although the application is usually very time consuming. Prior to the present invention, it was believed by those skilled in the art that a useful connection between two drilling rods could only be accomplished by using a strong coupling, such as a threaded connection. The use of a coupling(s) having small moveable locking elements was considered inapplicable, for fear that the locking element would seize in the locked state and would not be seizable by a tool due to its small size in order to take it out of the locking state, thus preventing the two drilling rods from being disconnected. This would be particularly relevant where the locking elements were to be designed to fit tightly in its surroundings for safety reasons.

On the other hand, one of skill in the art would have been led away from loose fitting locking elements that would be more easily released for the fear of unwanted uncoupling of the connecting during drilling. Keeping in mind that because of excessive forces, and especially the forces that impact the connection, any locking element that is easily displaceable along its longitudinal axis carries the risk of being displaced by such impacts and decoupling the connection.

Unwanted decoupling of the drill string is potentially devastating for horizontal drilling, which may extend as far as

100 m without any means for checking the drill string in the ground. If the drill string was to uncouple, there are few, if any, easy means to determine which of the many drill string couplings has decoupled at what stage of the drilling. Thus the man skilled in the art would not consider a connection mechanism as claimed for feeling it to be unsafe. It is these shortcomings in the field of drilling that the invention, as recited in the present claims, is intended to address.

With respect to the prior art, U.S. Patent No. 5,076,623 to Richards relates to a magnetically operated latch for door leaves.

U.S. Patent No. 5,645,302 to Horimoto discloses a coupling apparatus for coupling two members, especially hoses such as fire hoses. In one embodiment the coupling apparatus may employ magnetically moved locking elements.

U.S. Patent No. 3,837,525 to Kobayashi relates to a case with a bottom part and a cover part, which may be locked by means of magnetically moved latch parts.

Japanese Patent No. 4-331895 to Okawa discloses an electromagnetic ball lock type coupling which facilitates remote control and which can disconnect a fluid pipe in a dangerous place.

Furthermore, U.S. Patent No. 4,260,180 to Halushka relates to a coupling for a sonar towing array used with submarines or the like.

None of the cited prior art suggests using a magnetically moved locking element to establish a coupling between two parts of a drill string for earth drillings. Thus, it required an inventive effort by the applicant to design a coupling or a connection for two parts of a drill string which uses a magnetically moved locking element.

Accompanying this Amendment is an Information Disclosure Statement which includes references cited in (1) the International Search Report for the parent application and (2) the prosecution of a counterpart German application. The fee of \$180 for the Information Disclosure Statement accompanies this Amendment. If any additional fee, including any fee for the claims or for an extension of time is required, please charge our Deposit Account No. 50/1039.

Reconsideration and allowance of the claims are respectfully requested.

Respectfully submitted,



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